

Children's Understanding of the Stream of Consciousness

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FLAVELL, JOHN H.; GREEN, FRANCES L.; and FLAVELL, ELEANOR R. *Children's Understanding of the Stream of Consciousness*. CHILD DEVELOPMENT, 1993, 64, 387–398. Children and adults were tested for their understanding that there is a virtually continuous flow of mental content in a waking person, a “stream of consciousness” that continues to run even when the person is not examining stimuli perceptually or trying to solve a problem. There was a marked increase with age from preschool to adulthood in subjects’ tendency to say that a person who was just waiting quietly was having “some thoughts and ideas” rather than “a mind empty of thoughts and ideas.” 4-year-olds also tended to say that the mind of a waiting person was “not doing anything,” whether that person was another individual or themselves, and that a person who wanted to could keep his or her “mind completely empty of all thoughts and ideas” for 3 min. These results suggest that preschoolers’ conceptions of people’s mental lives may be quite different from those of older children and adults.

A considerable amount of research has been done during the past decade on children’s developing understanding of the mental world (e.g., Moses & Chandler, 1992; Perner, 1991; Wellman, 1990). The bulk of this “theory of mind” research has focused on children’s knowledge about mental states, such as beliefs, desires, knowledge, and emotions. Much less has been devoted to studying their understanding of mental activities, that is, mental things one could be said to *do*, such as think of or about something (D’Andrade, 1987). Wellman and his colleagues (Estes, Wellman, & Woolley, 1989; Wellman, 1990, chap. 2; Wellman & Estes, 1986; Woolley & Wellman, 1992, 1993) have shown that even 3-year-olds can distinguish between physical and mental entities and have at least some understanding of what it means to imagine, think of, or dream of something. Perner (1991) has also argued on theoretical grounds that children as young as this should be expected to have the basic concept of “thinking-of.”

In a recent series of studies by Flavell, Green, and Flavell (1992), preschoolers’ understanding of thinking was explored further by testing their ability to differentiate it from seeing, physically acting, talking (aloud),

and knowing—activities or states that often co-occur with thinking and with which young children might therefore confuse it. Flavell et al. (1992) found considerable evidence for such differentiation. Even young 3-year-olds gave evidence of believing that a person could be “thinking about” something that he or she was clearly not seeing, touching, or talking about at that moment. Four-year-olds also distinguished the activity of thinking from the state of knowing. For example, they seemed to understand that a person could not be thinking about something at the moment but still know about it.

There is of course more to learn about thinking, broadly defined, than that it is an internal activity distinguishable from perceiving, acting, talking, and knowing. One of its most interesting characteristics is its tendency to flow incessantly—the continuous “stream of consciousness” about which William James (1890, p. 239) and many others (e.g., Pope & Singer, 1978) have written. Our intuition, like that of James and others, is that something thought-like is going on in the mind of a conscious person virtually all of the time and that most adults have learned this. In support of this intuition, an unpublished questionnaire study we conducted re-

This research was supported by NIMH Grant MH 40687. We are grateful to the children, teachers, and parents of Bing School of Stanford whose cooperation made these studies possible. Authors’ address: Department of Psychology, Stanford University, Stanford, CA 94305-2130.

[*Child Development*, 1993, 64, 387–398. © 1993 by the Society for Research in Child Development, Inc. All rights reserved. 0009-3920/93/6402-0015\$01.00]

cently with 234 college students revealed that 76% thought the following statement was "probably true," 12% thought it was "probably not true," and 12% checked "no opinion": "Conscious mental events (ideas, percepts, images, feelings) normally follow one another more or less continuously in a person who is awake. They form a kind of 'stream of consciousness', with first one conscious mental event happening, then another, then another." Flavell et al. (1992) cite evidence that preschoolers will usually infer that person is thinking about something when the visible evidence for this activity is clear and strong, as when the person has been given a problem to solve and/or looks stereotypically reflective. For example, most of their 4-year-old subjects spontaneously said "thinking" when asked what a pensive-looking adult who had just been given a problem was "doing" and said this prior to any mention of the term by the experimenter. Although most of their 3-year-old subjects did not volunteer the term prior to its mention by the experimenter, they did choose it as the proper description of the person's behavior once introduced. Similarly, Rosenkrantz (1991) found that 3-year-olds correctly chose, as the person who was "thinking," the more pensive-looking of two videotaped models.

Do young children also realize that mental content comes to us in an essentially unstoppable flow during all of our waking hours, when not perceiving and problem solving as well as when doing these things? There are reasons to suspect that this realization might be fairly late-developing. With respect to inferring a stream of consciousness in others, another person who is not engaged in directed thinking will normally present the child with little observable evidence of any mental activity, that is, there will be no obvious problem or stimulus input and no expressive or behavioral output from which to infer the presence of mental content. The person is just "there," not obviously doing anything cognitive. With respect to the child detecting his or her own stream of consciousness, the same or similar cues are again likely to be absent; in addition, ongoing idle or undirected thinking (e.g., day-dreaming) may be less phenomenologically salient than deliberate, goal-directed thinking, and therefore less likely to be noticed and remembered by the child. The purpose of this investigation, then, was to find out whether children are aware of the ever-present, continuous nature of the stream of consciousness.

Study 1

The purpose of Study 1 was to assess, 3-, 4-, 6-7-year-olds', and adults' willingness to attribute an active mental life to another person in a context where there were no obvious external cues or environmental inputs to suggest that such mental life was occurring. Thus, the key task in the study involved asking whether one of the experimenters was having any thoughts or ideas or whether her mind was empty of thoughts and ideas while she was sitting quietly with her back to the subject facing a blank wall and had been described by the first experimenter as "just waiting" (Waiting task).

Method

Subjects.—Three groups of children and a group of college students were tested, with 20 subjects in each group. The mean ages for the children were 3-8 years (range 3-6 to 3-11), 4-6 (range 4-0 to 5-0), and 6-11 (range 6-2 to 7-6). Pilot work had suggested that older 3-year-olds were the youngest children who were able to comprehend the test questions. The 3-year-old group was composed of 11 boys and 9 girls. The 4-year-old group contained 10 boys and 10 girls. These subjects were drawn from a university laboratory preschool and were mostly children from upper-middle-class backgrounds. The 6-7-year-old group consisted of 7 boys and 13 girls. These subjects were drawn from two private elementary schools and were also of upper-middle-class backgrounds. All but one of the 20 college students (13 women and 7 men) were enrolled in an introductory psychology course. Most child and adult subjects used in these three studies were white and native born, but exact demographic information on them was not available. All subjects had a good command of the English language. All testing was done by the same female experimenter who was assisted by a second female experimenter.

Procedure.—The subjects were presented with four basic tasks, presented in a fixed order: *Waiting*, *Looking*, *Waiting*, and *Problem solving*. The critical *Waiting* tasks were presented in first and third positions. In second position the key test question was asked as the second experimenter (Ellie) was seen looking (Looking task) at pictures on the wall. The context for the fourth task, *Problem-solving*, consisted of asking Ellie to explain how a large pear got into a small bottle. We expected that most children would attribute thoughts and ideas to Ellie on the *Looking* and *Problem-solving* tasks where

the contexts were supportive of making that inference. The question of interest was whether they would also do so on the Waiting tasks.

Two schematic drawings of faces were provided, one with a thought bubble that was empty, and one with a thought bubble containing three asterisks established during the warm-up period as representing thoughts and ideas. The warm-up period was intended to familiarize subjects with the pictorial conventions, to give subjects practice utilizing these nonverbal response options in an instance where the correct response was "empty" and one in which the correct response was "having" thoughts and ideas, and to model for the subjects an instance of relatively undirected, stream-of-thought ideation as opposed to intentional, directed, problem-centered thinking. The first experimenter began the warm-up by asking Ellie: "When you were asleep last night, did you dream?" She responded: "No, I didn't dream. I was very tired and very deep asleep." Experimenter 1 (E1) continued: "Well, when you were deep asleep and not dreaming, were you having any thoughts and ideas or was your mind empty of thoughts and ideas?" Ellie said: "My mind was empty of thoughts and ideas." E1 then introduced the two pictures, placing them in random order in front of the subject and said: "Which picture shows how your mind was when it was empty of thoughts and ideas?" Ellie pointed to the correct thought bubble and said: "That one, because it doesn't have any thoughts and ideas in it." E1 continued by asking Ellie whether or not she had had any thoughts and ideas while on her way to the child's school (or the office) that morning and she responded: "I was having some thoughts and ideas. I thought about my son's birthday dinner, and then I wondered if he would like his present. Then I thought about making a big chocolate cake." Ellie was asked to identify the picture that showed how her mind was when she was having some thoughts and ideas and she did so, saying: "That one, because it has some thoughts and ideas in it." Next, the subject was asked to point to the picture that showed how Ellie's mind was when she was sleeping and her mind was *empty* of thoughts and ideas and then asked to point to the picture that showed how her mind was when she was on her way to the school, when she was *having* some thoughts and ideas. Three of the youngest subjects erred on this warm-up. These subjects were given corrective feedback and retested before proceeding. E1 concluded

the warm-up by saying: "Good. This one shows how her mind was when her mind was *empty* of thoughts and ideas, and this one shows when she was *having* some."

For the two identical Waiting tasks, Ellie was asked to "please move over to that chair and wait there for a few minutes. Just stay there. I'll tell you when we are ready." After a brief pause of approximately 3–4 sec the experimenter commented: "Ellie is just sitting there waiting, isn't she?" The test question was as follows: "How about her mind right now? Is she having some thoughts and ideas or is her mind empty of thoughts and ideas? Point to the picture that shows how her mind is while she is waiting there." On the second of these Waiting tasks Ellie was directed to move to a different corner of the room. In both tasks she sat quietly, with her back to the subject. On the second task, the Looking task, E1 pointed to some pictures to Experimenter 2's (E2's) right and said: "Ellie, I hung those animal pictures up the other day." She responded: "Oh I can see them." At the time of the test question her profile and line of sight were visible to the child. The test question was nearly identical to that given above, the exception being the last phrase: "Point to the picture that shows how her mind is while she is looking at those pictures."

Before proceeding to the third task, the second Waiting trial, E1 once again asked the subject to identify the picture showing how Ellie's mind was when she was asleep and empty of thoughts and ideas and to identify the picture showing how her mind was when she was on her way to the school, when she was having thoughts and ideas. Only one subject, a 3-year-old, erred on these two questions: this subject was excluded from the study. E1 shifted the left-right orientation of the two pictures and proceeded with the second Waiting task.

On the fourth, Problem-solving task, Ellie was told: "I'm ready for you to do something else. I'd like you to tell me how this big pear got into this little bottle." She said: "Hmm. That's a hard question. (Her face looked pensive). Give me just a minute." and then turned her back to the subject. The standard test question was asked with the variation that E1 said: "Point to the picture that shows how her mind is while she is sitting there." After the subject responded, Ellie explained how the pear did get into the bottle (it grew inside it).

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Results and Discussion

Table 1 shows the number of subjects in each age group attributing "some thoughts and ideas" rather than a "mind empty of thoughts and ideas" to the second experimenter (Ellie) in each task condition. The two older groups were significantly more likely than the two younger ones to attribute thoughts and ideas to Ellie during the Looking task, $\chi^2(1, N = 80) = 4.11, p < .05$, and the Problem-solving task, $\chi^2(1, N = 80) = 16.97, p < .01$. (It was necessary to combine groups for these two analyses to avoid having expected cell frequencies of less than 5.) More striking, however, were the marked increases with age across all four groups for the two Waiting trials: for Waiting 1, $\chi^2(3, N = 80) = 34.29, p < .001$; for Waiting 2, $\chi^2(3, N = 80) = 29.52, p < .001$. The numbers of 3's, 4's, 6-7's, and adults attributing ideation on both Waiting trials were 1, 4, 11, and 19, respectively, $\chi^2(3, N = 80) = 39.16, p < .001$. The numbers not attributing ideation on either Waiting trial were 16, 7, 3, and 1, respectively, $\chi^2(3, N = 80) = 29.69, p < .001$. Of the 20 3-year-olds, 16 attributed ideation more often on Looking and Problem-solving tasks than on Waiting tasks, and none showed the reverse pattern (and there were four ties), $p < .002$ by Sign test. The corresponding figures for the 4-year-olds were 13 versus 3, $p < .02$, and for the 6-7-year-olds, 9 versus 2, $p < .06$. Several of the 4-year-olds made comments which suggested that they did not attribute thoughts and ideas to Ellie on the Problem-solving task because she had not yet solved the problem and therefore had not yet acquired the needed thoughts and ideas. Of the 20 3- and 4-year-olds who attributed thoughts and ideas on both the Looking and the Problem-solving trials, two did so on both Wait trials, nine on one Wait trial, and nine on neither Wait trial. This shows that their unwilling-

ness to attribute mentation on the Wait trials was not due to a general unwillingness to attribute mentation, an antipathy toward the nonempty thought bubble, or some similar response bias.

There appeared to be qualitative differences between the reactions of the 3-year-olds and those of the 4-year-olds. Only four of the 20 3-year-olds hesitated for several seconds before responding to the first Waiting task; the other 16 responded quickly and seemingly confidently, giving the incorrect answer on both tasks. In the 4-year-old group, on the other hand, 13 of the 20 subjects hesitated before giving their answer. Similarly, nine 4-year-olds gave different answers on the two Waiting trials whereas only three of the younger subjects did. In addition, Table 1 shows that the 3-year-olds as a group performed significantly worse than chance on each Waiting trial whereas the 4-year-olds' performance was in the chance range (6-14). Thus, most of the 3-year-olds seemed to assume unhesitatingly that a physically inactive person with nothing to look at and no problem to solve had an empty mind, devoid of any thoughts and ideas. In contrast, a number of the 4-year-olds seemed to think that such a person might be having some thoughts and ideas or might not—one couldn't be sure. It is also possible that some of the 4-year-olds may have refrained from attributing ideation solely because they had no clues as to its content.

Finally, it should be noted that children usually responded by simply pointing to one thought bubble or the other. This meant that in order to respond incorrectly they had to select the empty and presumably less interesting one. Moreover, the empty bubble had previously been associated only with a state of deep, dreamless sleep—clearly not the

TABLE 1

NUMBER OF SUBJECTS IN EACH AGE GROUP ($N = 20$) ATTRIBUTING THOUGHTS AND IDEAS TO THE SECOND EXPERIMENTER IN EACH TASK CONDITION OF STUDY 1

AGE GROUP	TASK CONDITION			
	Waiting 1	Waiting 2	Looking	Problem Solving
3	3*	2*	14	13
4	7	10	18*	13
6-7	16*	12	18*	20*
Adult	19*	19*	20*	20*

NOTE.—Numbers significantly different ($p < .05$) from chance expectation of 10 by Binomial Test are marked with asterisks.

state that Ellie was in on the Wait trials. The fact that they chose it so often suggests that many of them really did believe Ellie had no thoughts and ideas while just sitting there waiting. Because she had not been given a thinking task and gave no visible evidence of thinking, they probably just assumed that she wasn't thinking.

Study 2

In Study 2 we attempted to see whether the results of Study 1 would replicate for 4-year-old subjects when we altered the training procedures and test questions. We thought it possible that Study 1 may have underestimated the competence of subjects; in our warm-up period we may have failed adequately to convey that idle, undirected, non-problem-solving type thought was to be included in the definition of what it meant to have thoughts and ideas. Accordingly, in Study 2 we altered both the training in the warm-up period and the test question, to stress nondeliberate thinking, or thoughts just effortlessly "popping into one's head." A second major change was to include only Waiting trials—three this time rather than two. It is possible that there were unknown order effects in Study 1 that influenced a subject's performance on his or her second Waiting trial. Recall that this second Waiting trial was preceded by a Looking trial in which E2 viewed pictures. The contrast between the two test contexts might have suggested to the subjects that they should be responded to differently. We attempted to keep Study 2 as similar as possible to Study 1 except for the aforementioned changes; for example, we continued to use the same pictures of thought bubbles to give subjects nonverbal response options. We chose 4-year-olds as the target for this replication study, reasoning that if our new procedures were not of assistance to this age group, neither would they assist younger children who performed less well in Study 1.

A third change was the addition of a new task testing subjects' views as to whether E2 would be able to keep her mind completely empty of thoughts and ideas for a period of time if she tried to do so. Most adults probably believe that one cannot successfully dam the stream of consciousness. In support of this supposition, the unpublished questionnaire study referred to in Study 1 showed that 9% of 234 college students thought the following statement was "probably true," 87% thought it was "probably not true," and 4% claimed "no opinion": "The average per-

son can completely rid his or her mind of all conscious experiences for long periods of time—for example, can remain fully awake but allow no thoughts, percepts, images, or feelings whatsoever to enter consciousness for a whole hour." We expected that 4-year-olds would be likelier to think that one could dam the stream.

Method

Subjects.—Sixteen 4-year-olds (mean age 4-6, range 4-0 to 4-11) were tested, nine boys and seven girls. They were drawn from the same laboratory preschool, but none participated in the first study. No subject was excluded from the study. All testing was conducted by two female experimenters.

Procedure.—In the first portion of the warm-up period, subjects were shown an egg timer. It was explained that it took 3 min for the sand to run from one side to another and that they would be given an opportunity to color for that period of time, while the sand was running. After the 3 min E1 removed the child's drawing and explained that he or she could complete it later. The remainder of the warm-up period was similar to that of Study 1 in that we introduced the children to the thought-bubble pictures and modeled what was meant by undirected as well as directed thoughts. E1 began by saying: "Today I will ask you some questions about thinking. But first let me ask Ellie (E2) some things. Ellie, do you have to *try* to think about things or sometimes do thoughts and ideas just seem to happen in your mind or head?" E2 responded: "Well sometimes I try to think, like when I try to think about things I want to do tomorrow, or stuff like that. Other times I don't *try* to think at all but thoughts and ideas just pop into my mind anyway." E1 continued, much as in Study 1, by asking whether or not E2 had dreamed last night, and E2 denied that she had. E1 asked: "Was there anything going on in your mind when you were deep asleep and not dreaming? Were some thoughts and ideas popping in or was your mind empty of thoughts and ideas?" E2 responded that her mind was empty of thoughts and ideas, and that: "No thoughts and ideas were popping in while I was deep asleep and not dreaming." E1 asked: "Which picture shows how your mind was when it was empty, when thoughts and ideas were *not* popping in?" E2 pointed and replied: "This one because there are no thoughts and ideas happening in my mind." E1 then asked about the status of E2's mind while she was walking in to school that day. "Were some thoughts and

ideas popping in or was your mind empty of thoughts and ideas?" Once again, we attempted to stress undirected as well as directed thought. E2 responded: "Some thoughts and ideas popped in to my mind. I was walking along and suddenly the idea popped in that my dog needed a new collar. So I tried to figure out where the best place would be to buy the collar. And then, I don't know why, but I suddenly got the idea that an ice cream cone would taste very delicious. Then I remembered the ice cream store was closed. Some thoughts and ideas popped in to my mind when I was walking in to Bing." E1 asked: "Which picture shows how your mind was when some thoughts and ideas were popping in?" and E2 replied: "This one, because these stand for the thoughts and ideas that were happening in my mind." Next, as in Study 1, the subject was asked to identify the picture showing Ellie's mind when it was empty of thoughts and ideas and the picture showing it when some thoughts and ideas were popping in. No child erred.

The three Waiting trials were very similar to those of Study 1, the exceptions being a slight modification of the test question and the use of counterbalancing of response options within questions. In Study 2 the subject was asked: "How about her mind right now? Are some thoughts and ideas popping in or is her mind empty of thoughts and ideas? Point to the picture that shows how her mind is while she is waiting there." Half the subjects were given the reverse order of question options on all three tasks. E2 waited on the first trial, and E1, moving to a different location, waited on the second trial. After trial 2 E1 returned to the table and asked the subject to identify once again the picture showing E2's mind when it was empty of thoughts and ideas and the picture showing her mind when some thoughts and ideas were popping in. E1 switched the left-right orientation of the pictures and asked E2 to wait again. E2 did so by moving to yet a third location. On all three Waiting trials the experimenter faced a blank wall with her back to the subject.

Two probe tasks were given at the end of the testing session in the following fixed order. E2 moved to the position used for trial 1 as E1 said: "Here's a different question. Ellie is going to sit over there and wait again. But this time she is going to try very hard to keep thoughts and ideas from popping in to her mind. She is going to try to keep her mind completely empty of all

thoughts and ideas. We'll wait a little while too. (E1 paused for about 5–6 sec.) While she is waiting there, is she keeping her mind completely empty of all thoughts and ideas, or not?" The second probe task was intended to draw on the subject's knowledge of the span of a 3-min period provided during the warm-up and to ask about Ellie's capability as opposed to her current state. E2 said: "Remember the timer. I am going to start it. Ellie is going to try to keep her mind completely empty of all thoughts and ideas for as long as it takes for all the sand to run to the other side. (E1 turns timer over.) Will she be able to do that, or not?"

Results and Discussion

The numbers of 4-year-olds out of 16 correctly choosing nonempty thought bubbles on the first, second, and third Waiting task trials were 6, 4, and 8, respectively; a figure of 13 or greater would be needed to exceed chance expectation of 8 by Binomial Test ($p < .05$). The numbers of subjects choosing correctly on 3, 2, 1, and 0 trials were 2, 3, 6, and 5, respectively. The mean percentage of correct Waiting trials for the 4-year-old group in Study 1 was 43%; the corresponding figure for this study was 38%. Clearly, including only Waiting tasks and stressing the admissibility of undirected as well as directed thinking did not change 4-year-olds' judgments: as in Study 1, the majority judged that the experimenter was not having any thoughts or ideas while she was waiting.

Consistent with this conclusion, only eight subjects judged that she was unable to keep her mind completely empty of all thoughts and ideas in response to the first probe question, and only six said she would be unable to keep it empty for as long as 3 min in response to the second probe question; neither figure exceeds chance expectation. There was no relation, $r(14) = .05$, N.S., between performance on the three Waiting trials and responses to the two probe questions. Thus, these 4-year-olds were probably less certain than the adults queried in our questionnaire study that one cannot stop for long the flow of thoughts and ideas in a waking person, although it should be noted that the time periods in question were briefer for the children than for the adults.

Study 3

Study 3 was a replication of Studies 1 and 2, but with four important changes.

First, we tried to make the child's task easier in two ways. We emphasized the process (thinking) rather than the product (thought), and we characterized the seat of the process more broadly and undifferentiatedly as "brain or mind," in hopes that if one term were not meaningful to a given child the other one would be. Johnson and Wellman (1982) have shown that 4-year-olds do not differentiate mind and brain but do associate both with mental processes. Our test question was, therefore, about whether a waiting person's *brain* or *mind* was *doing something* rather than whether the *person* was *having thoughts or ideas*—thus, was the brain or mind active or not, rather than did it have content or not. The children could not know the content of the experimenter's thoughts and therefore might be loathe to attribute any; however, they might at least recognize that her mind or brain must be *doing something*. Second, we used outline drawings of a head in profile with the location of the brain indicated. An active brain, one that was "doing something," was represented by a short uneven jagged line within the brain; there were no lines in the second drawing, representing an inactive brain, one that was "not doing anything." We could not refer to the state of dreamless sleep to fix the meaning of the latter, as in Studies 1 and 2, because the brain is of course "doing something" even in that state. These drawings allowed the children to answer either verbally or nonverbally, as in Studies 1 and 2. Third, the children were also asked to introspect about their own thinking. We wondered if they would be aware of their own mental activity, and if they were, whether this awareness would lead them to attribute mental activity to the experimenter. Fourth, we thought that increasing the length of the waiting period might make it easier for the child to realize that activity might be taking place. We chose to test 4-year-olds again because of the limited understanding they seemed to show in Studies 1 and 2.

Method

Subjects.—Sixteen 4-year-olds, eight girls and eight boys, with a mean age of 4-6, were tested (range 4-1 to 4-10). They attended the same university laboratory school, but none participated in the two previous studies. The testing was done by two female experimenters.

Procedure.—The child and E1 were seated at a table on one side of the room with E2 seated across the table. Chairs were placed in the far corners of the room, facing

away from the child and toward empty walls. After a short explanation about what brains and minds do and an explanation of the pictures of the head and brain, each experimenter in turn sat quietly in one of the chairs for about 10–12 sec and "waited," facing away from the child so that her eyes could not be seen. The child was asked about the mind of the person who was waiting (Waiting trials 1 and 2). The child then had the experience of moving to a chair and waiting. After he (or she) returned to his seat at the table, he was asked about the *past* state of his own brain or mind, that is, while he had been waiting (Waiting trial 3). A brief time was then spent looking for animals in a picture book, and then the child was asked to sit for a minute while E1 straightened out some papers. He was then asked about the *present* state of his own mind (Waiting trial 4). The 10 children who showed any inconsistencies in their answers were given an additional trial with E2 again "waiting" in one of the chairs. E2 always waited first, followed by E1. The position of the two pictures was unsystematically varied at the start and was changed between Waiting trials 1 and 2 and again between Waiting trials 3 and 4. The order of choices in the test question was alternated, half the children receiving "doing" first and half receiving "not doing" first.

E1 introduced the procedure by saying, "Do you know what your brain or mind does? (Pause for any voluntary response.) I have a brain in my head and you have a brain in your head. Brains or minds are important, they do a lot of things. We use them for figuring things out, deciding what to do, remembering, and other things. Sometimes our brains or minds seem to do things by themselves. For example, new ideas or memories just pop into our brains or minds without our even trying. You'll be working at one thing and find yourself *thinking* about something else."

E1 showed the drawing of a head with no lines to indicate activity. "Here's a picture of someone's head. This is where the brain or mind is. The picture shows a brain or mind that's *not doing* anything." E1 then placed the second drawing to one side or the other of the first. "This other picture shows a brain or mind that *is doing* some things—things like having ideas or remembering. Okay, which picture shows a brain or mind that's *not doing* anything? Good. And which picture shows a brain or mind that *is doing*

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something? Good. This mind is *not doing* anything and this one *is*.

E1 then said to E2, "Francie, would you go sit in that chair and wait for just a minute? Just sit there and I'll tell you when we're ready." E2 moved to a chair to the right of the child, saying, "Yes, I can do that." E2 sat quietly facing the empty wall, E1 and the child also sat quietly for 8–10 sec (Waiting 1). E1 said quietly to the child, "Francie's waiting over there, isn't she? While she's waiting is her mind *not doing* anything (pointing to the picture of the brain which showed no activity) or is her mind *doing* something (pointing to the picture which represented activity in the brain)? Which picture shows how her brain or mind is while she's waiting there?"

At this point the position of the two pictures was reversed and E2 said, "Ellie, would you go sit in that chair and wait for just a minute?" E1 moved to the chair to the left of the child saying, "Sure, I can do that." (Waiting 2). The order of the choices in the test question was reversed, but otherwise the procedure was identical to Waiting 1.

E2 then said to the child, "Okay. Now you and I'll take a turn sitting in the chairs. We'll wait over there for just a little while. Which chair do you want to sit in? Okay, I'll take this one." E1 asked them to wait for just a minute and after 8–10 sec (Waiting 3), told them that they could come back again (to their original chairs). E1 then asked the child about his own experience while he had been waiting. "Okay, while you were waiting over there (pointing to the chairs in the corner), was your mind *not doing* anything (pointing to inactive brain) or was your mind *doing* something (pointing to the active brain)? Which picture shows how your brain or mind was while you were waiting there?" If the child indicated that his brain had been doing something, E1 asked, "What was your mind doing while you were waiting over there?"

E1 then reversed the position of the head pictures once again and showed the child a new picture with many jungle animals of all sizes. "Here's a picture. Show me all the animals you can find. Very good. Okay, we've about finished the game. You did a great job. Just sit there a minute while I straighten out these papers." After 8–10 sec (Waiting 4) E1 asked the test question, which focused on the present experience of the child. "While you are waiting, is your mind *doing* something (pointing to the ac-

tive brain picture) or is your mind *not doing* anything (pointing to the inactive brain)? Which picture shows how your brain or mind is while you are waiting here?" If the child indicated that some activity was going on, E1 asked "What is your mind doing while you are waiting here?"

At the end of the session 10 of the 16 children also received a fifth Waiting trial involving an experimenter's mental activity, and thus identical to Waiting 1 and 2.

Results and Discussion

The numbers of subjects from the sample of 16 who correctly indicated that the experimenter's mind was "doing something" while she was waiting were seven for Waiting trial 1 and eight for Waiting trial 2; neither figure differs significantly from chance expectation by Binomial Test (13 or greater would be required to exceed it). Six of the subjects made this judgment on both trials, three on 1 trial, and seven on no trials. The mean percentage of correct trials was thus 47%, quite similar to the 43% of Study 1 and the 38% of Study 2. The corresponding numbers for Waiting trials 3 and 4, which inquired about the subject's own mental activity rather than the experimenter's, were 9 and 12, respectively; the former figure does not differ significantly from chance expectation; the later also falls short of significance, $p < .08$. Eight of the subjects attributed mental activity to themselves on both trials, five on 1 trial, and three on no trials. Analyses by t test ($df = 15$) showed that Waiting 3–4 performance was not significantly better than Waiting 1–2 performance. The correlation between scores (0–2) on the two sets of trials was also not significant, $r(14) = .30$, N.S. When subjects did select the "doing something" option on Waiting 3 or 4, they were asked "what their mind was doing." Their responses to this question revealed little of interest except that, in the course of trying to answer it, three subjects in Waiting 4 changed their response to "not doing anything"; if these three subjects were not counted as correct responders, the number of subjects correct for this trial (nine) would be very similar to those of the other three trials. Finally, of the 10 subjects who were given a fifth Waiting trial, again concerning the experimenter's mental activity, only two said her mind was doing something.

The results of this study provide support for two conclusions. First, 4-year-olds appear to be no more likely to attribute unspecified mental activity ("doing something") to

the mind or brain of another person who is waiting than to attribute "some thoughts and ideas" to the person. Second, they also do not seem much more disposed to attribute such activity to themselves than to attribute it to others.¹

General Discussion

The purpose of this research was to determine whether preschool children are aware of the "stream of consciousness" character of human mental life: the fact that there is an essentially continuous and unstoppable flow of mental contents in a conscious individual. The results of our three studies suggest that they are largely unaware of this important property of the mind. In Study 1 we found a very marked increase with age from 3 to adulthood in subjects' tendency to attribute "some thoughts and ideas" rather than a "mind empty of thoughts and ideas" to an experimenter who just sat quietly, "waiting." For example, the percentages of 3-year-olds, 4-year-olds, 6-7-year-olds, and adults attributing some mentation to the experimenter on both of the two occasions when she sat quietly were 5%, 20%, 55%, and 95%, respectively. Most of the 3-year-olds seemed to assume without hesitation that her mind was empty; the 4-year-olds seemed less sure of their answers, although also frequently choosing the "empty" option. In Studies 2 and 3 we tested only 4-year-olds. In the pretraining period of Study 2 we tried harder than in Study 1 to convey that "thoughts and ideas" should be taken to include nondeliberate, undirected thinking as well as deliberate, directed thinking. However, the percentage of attributions of thoughts and ideas to the waiting experimenter did not increase as a result. The 4-year-olds in this study also showed little awareness that people cannot stop for long the flow of their thoughts and ideas even if they try. In Study 3 we focused on mental processes rather than mental products, asking subjects whether the experimenter's mind was "doing something" or "not doing anything" while she waited. This manipula-

tion also failed to increase 4-year-olds' attributions of ideation to the experimenter; their attributions remained at chance level. Finally, subjects also did little better when asked to indicate whether their own minds were "doing something" when they, rather than the experimenter, did the waiting. It seems possible that children progress developmentally from thinking there is no ideation in an inactive, taskless person, to thinking there might be, to thinking there must be because the flow of ideation cannot be stopped. Further research would obviously be needed to verify the existence of such a developmental sequence.

It is of course possible that the children really thought that there was, not a total absence of mentation during Wait trials, but simply less of it than on the other trials. As against this possibility, the experimenter did make it very clear that the intended contrast was between *no* mentation ("empty mind" or "mind not doing anything," and a thought bubble or head that was depicted as being completely empty) and *some* ("some thoughts and ideas," "doing something"). Nevertheless, some young children might have chosen, for example, a mind that was "doing just a little" over one that was "doing nothing" if they had been given such a choice.

Children have acquired a considerable amount of knowledge about the workings of the mind by the ages of 4 or 5 (e.g., Moses & Chandler, 1992; Perner, 1991; Wellman, 1990). They know that different people can have different beliefs, desires, emotions, and other mental states; that people can hold false as well as true beliefs; that things can present different perceptual appearances from different positions; that things can simultaneously appear to be this but really be that, and more. As noted in the introduction, they also seem to know at least roughly what it means to think about something and will attribute this activity to others when the cues are clear and strong, for example, when the person has accepted a thinking task and/

¹ It might be objected that these 4-year-olds were not in fact having any sort of mental content while they were waiting, or even that young children really do have long stretches of consciousness in which there is no content. According to this argument, young children would be incognizant of content much of the time because, unlike their elders, they would actually not be having any; small wonder, then, that they would not attribute content to inactive others. We find this argument implausible on its face. What would it mean for a person to be conscious but to have no conscious content of any kind? In addition, in several recent unpublished studies we have found that even 5-year-olds will usually not report having just thought about anything when asked even when, thanks to experiences we had just provided them with, we know both that they had been thinking and also what they had been thinking about.

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or looks very reflective (Flavell et al., 1992). Yet the present data suggest that even some 6–7-year-olds may not be aware of the continuous, nonstop nature of mental activity and that most preschoolers almost certainly are not. Why might this awareness be so late in developing?

One possible reason was cited in the introduction: the absence of external, observable evidence for a continuous stream of consciousness. In the case of directed, task-elicited thinking and other mental processes and states there often is such evidence. We can often infer from observable stimulation or observable responses what we and other people currently perceive, think about, know, believe, want, feel, intend, and the like. However, there is by definition no such overt evidence to go on when self or other is on idle, quiescent, with nothing noteworthy coming in or going out. A person on idle presents an interesting form of perceptual illusion or appearance-reality discrepancy: he or she does not appear to be doing anything either physical or mental, and in fact is not doing anything physical; in reality, however, mental activity of one sort or another is going on inside, beneath the deceptively inactive appearance.

A second possible reason for the relatively late development of this awareness is that, in all probability, other people seldom call the child's attention to it. Unlike the case with many other commonplace mental phenomena, people probably seldom find any reason to talk to young children about the ceaseless flow of mental content, and there is no single term for it in the mental state lexicon for the people to use or the children to learn. Young children and other people (parents, siblings, peers) talk to one another about what people want, feel, intend, etc. (e.g., Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Shatz, Wellman, & Silber, 1983), but not about the existence (let alone the possible content) of people's ongoing ideation when not engaged with their environment.

A third contributor might be a general lack in young children of the disposition and ability to introspect. Young children may seldom try to reflect on the contents of their consciousness and might have difficulty doing so if they tried. This is certainly most people's view of young children, and the data on 4-year-olds' introspective abilities from Study 3 tend to support it. To compound their difficulties, undirected thinking

may be harder to attend to or reconstruct than directed thinking. In directed thinking there are such added internal cues as the knowledge of the goal toward which the thinking is directed, and the sense of concentration and mental effort that accompanies the pursuit of that goal.

How might children come to discover the stream of consciousness? We obviously do not know but would venture the following speculation. They may first become aware of it during the relatively brief and infrequent times in their day when they are awake but physically inactive, not actively engaged either perceptually or motorically with their world. Such a time for many children may be the period between going to bed and going to sleep. Some of the trains of thought that occur at such times might have two properties that would facilitate this awareness. On the one hand, they are charged with negative affect and are therefore impossible not to notice. An example might be the thought that there is or will be a monster in their darkened room, a common fear of young children. On the other hand, they may want to rid their minds of such thoughts but find they cannot; the thoughts stubbornly resist the children's efforts to suppress them. More generally, persistent worries and other preoccupations may be among the first examples of the stream of consciousness to be noticed by children.

Thus, our data suggest that, despite their considerable knowledge about the mind, young children's conception of themselves and other people as mental creatures may still be very different from that of older children and adults. Adults tend to assume that mental activity is essentially continuous in time, with *something*—one thing or another—going on all the time in the waking mind (and perhaps in the sleeping mind as well). Young children, on the other hand, may view mental activity as an on-and-off, episodic affair. They may assume that the mind is active only when it has some job to do—when there is some stimulus to notice or some problem to solve. When it has nothing to do, it is assumed to do nothing, much as our bodies do nothing when we are physically inactive. This hypothesis about their conception of the mind has an interesting implication for the way we think about perspective-taking development. For decades students of this development have been asking what mental content young children will attribute to others, for example, whether or not they will egocentrically misattribute

their perspective to another person. Our data suggest that the question should sometimes be whether they are likely to attribute any mental content at all, egocentric or otherwise.

The development assessed in these studies may be linked to other developments. As argued previously, an inactive waking person presents an appearance-reality discrepancy: the person's appearance does not suggest the presence of mental activity, but mental activity really is present nevertheless. We have suggested that this discrepancy may contribute to young children's poor performance on our attribution tasks. Similarly, young children also tend to perform poorly when confronted with discrepancies between other psychological appearances and realities, as when a story character really feels unhappy but has reasons to put on a happy face (Harris & Gross, 1988) or when the character looks like a nice person but really is not (Flavell, Lindberg, Green, & Flavell, 1992). Thus, it may be generally difficult for young children to attribute psychological insides that contradict external appearances, whether the insides take the form of ideation, feelings, or moral character. Indeed, it is difficult enough for adults to do.

Gordon and Flavell (1977) found that preschoolers have little understanding of what they referred to as *cognitive cueing*, that is, the tendency of one thought to trigger another, related thought, which in turn triggers yet another, and so forth (see also Sodian & Schneider, 1990). It seems possible that children's understanding of cognitive cueing and of the stream of consciousness might develop together, with each concept perhaps facilitating the acquisition of the other. On the one hand, as they become aware that they have first one thought, then another, then another in an extended sequence or stream, they might notice that one thought is often related semantically to, and seemingly stimulated by, its predecessor. Conversely, coming to realize that one thought often cues the next which often cues the next, and so on, leads naturally to the idea that there would be extended sequences or streams of such interlinked thoughts rather than just occasional islands of isolated thoughts with nothing between them.

Finally, an understanding of the enduring stream of consciousness may develop apace with an understanding of psychologi-

cal entities that tend to be persistent rather than punctate and episodic. These could include persistent worries, preoccupations, or fantasies, lingering emotions and moods, and enduring beliefs, attitudes, desires, and intentions. Learning that people's minds are inhabited by persistent as well as episodic processes should play an important role in the child's construction of concepts of self and personality. Indeed, it is hard to see how children could fully acquire these concepts until they realize that they and others have continuous inner lives that define the sort of self and personality each individual has.

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